2813

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#16 Req for Recon. JMC 4/11/03

In re the Application of

Eiji NATORI

Group Art Unit: 2813

Application No.: 09/819,688

Examiner: D. Hogans

Filed: March 29, 2001

Docket No.: 109120

For: METHOD AND DEVICE FOR MANUFACTURING CERAMICS, SEMI CONDUCTOR DEVICE AND PIEZOELECTRIC DEVICE

REQUEST FOR RECONSIDERATION

Director of the U.S. Patent and Trademark Office
Washington, D.C. 20231

Sir:

In reply to the December 30, 2002 Office Action, the period for reply effectively extended to March 31, 2003, reconsideration of the above-identified application is respectfully requested in light of the following remarks.

Claims 1-13 and 15-17 are pending.

I. REPLY TO REJECTIONS

In item 3 of the Office Action, claims 1, 4, 6-10 and 11 are rejected under 35 U.S.C. §102(e) as anticipated by U.S. Patent No. 6,110,531 to Paz de Araujo et al. (hereinafter "Paz"). The rejection is respectfully traversed.

Applicants submit that Paz fails to disclose a method for manufacturing ceramics by mixing a fine particle of a raw material species which becomes at least part of raw materials for ceramics with an active species and feeding the mixed fine particle and active species to the substrate, as recited in claim 1.

Paz is directed toward generating liquid precursors containing compounds used in chemical vapor deposition and transporting in carrier gas through tubing at ambient temperature to form thin-film of layered super lattice compound (see Abstract). Paz mentions feeding a vaporized source of at least one compound into manifold 14, which in turn feeds the vaporized source into a chamber 2 and a carrier gas source 18 which passes through the liquid source in container 20 to become saturated with the liquid source and then fed into manifold 14 through tube 40 (see col. 5, lines 22-28). Paz mentions that the carrier gases may be inert or active and may contain a catalyst to increase the deposition rate (see col. 5, lines 28-30). Paz mentions mixing the carrier gas and a liquid resulting in heavily saturated (atomized) gas-liquid mixture that is introduced into the deposition chamber 2 by way of a suitable nozzle (see col. 5, lines 48-55).

Based on the complete reading of the disclosure in Paz, the carrier gas cannot be the active species recited in the application. Paz discloses that its carrier gas is typically argon or nitrogen (see col. 9, line 23). However, the gas can also be oxygen (see col. 9, lines 47-65). In col. 10, Paz continues to disclose supplying oxygen or argon or other gasses. The purpose of Paz's carrier gas such as argon and also oxygen becomes clear in col. 14, line 38 - col. 15, line 22. Specifically, the carrier gas is meant to be either a gas that carries liquid precursors or the gas in which the fabrication of the layer occurs. That is, rather than directly causing or playing a part in the formation of the layer, the carrier gasses are merely meant to either carry the liquid precursors or become the ambient flow where subsequent crystallization or recrystallization during furnace anneal is performed.

The fact that the carrier gas can not be the active species becomes clear when Paz specifically discusses ion implantation step 622 that uses argon, helium, oxygen or similar ions that create additional nuclei for growing grains with mixed orientation that may be

performed prior to the RTP step 624 or furnace anneal step 626 to create crystallization sites (see col. 15, lines 4-10).

Applicant submits that the use of active species is to provide the fine particles of raw material species to be deposited on the substrate with the kinetic energy provided from the active species having high kinetic energy before allowing the active species and the fine articles to come in contact with the substrate. (See specification, page 4, line 26 - page 5, line 4). Consequently, Paz fails to disclose an active species, because Paz merely discloses carrier gases that are meant to carry the liquid precursors through the nozzle and onto the deposition chamber. Consequently, Paz's carrier gasses does not provide kinetic energy to the liquid precursors. Therefore, claim 1 is distinguishable from Paz. Claims 4, 6-10 and 11 are likewise distinguishable over the applied reference for at least the reason discussed above and for the additional features they recite. Withdrawal of the rejection of claims 1, 4, 6-10 and 11 is respectfully requested.

In item 5 of the Office Action, claims 1, 2, 5, 15, 16 and 17 are rejected under 35 U.S.C. §103(a) over U.S. Patent No. 6,232,167 to Satoh et al. (hereinafter "Satoh") in view of U.S. Patent No. 5,456,945 to McMillan et al. (hereinafter "McMillan"). The rejection is respectfully traversed.

Applicant respectfully submits that neither Satoh, McMillan, nor their combination disclose a method for manufacturing ceramics by mixing a fine particle of a raw material species which becomes at least part of raw materials for ceramics with an active species, and feeding the mixed fine particle and active species to the substrate, where the ceramic film is formed by an LSMCD process or a misted CVD process, as recited in claim 1.

Satoh is directed towards producing a thin-film coated on a substrate by forming a crystalline thin-film on a substrate at a first substrate temperature at which crystal grows and forming a ferroelectric thin-film on the crystalline thin-film at a second substrate temperature

that is lower than the first substrate temperature (see col. 4, lines 17-24). However, Satoh fails to disclose an active species as discussed above. Specifically, Satoh discloses that bismuth raw material or a titanium raw material are supplied to a film forming chamber together with argon gas as carrier gas and gaseous oxygen as reaction gas (see col. 7, lines 20-26). Consequently, argon is merely a carrier gas to carry the raw materials to the chamber. Oxygen on the other hand, rather than an active species, is merely another raw material that reacts with bismuth and titanium to create the bismuth titanate thin-film (for example, $Bi_4Ti_3O_{12}$)(see col. 7, lines 14-65). Further, as indicated in the Office Action, Satoh fails to teach forming the ceramic film by LSMCD or a misted CVD process. Consequently, claim 1 is distinguishable from Satoh.

McMillan fails to overcome the deficiencies in Satoh. McMillan is directed towards fabricating an integrated circuit by forming at least one precursor liquid of including an element and a solvent, providing a substrate within a closed deposition chamber, producing a mist of the precursor liquid, and introducing the mist into the deposition chamber at ambient temperature so that the mist is flowed evenly over the substrate to form a film of the precursor liquid on the substrate (see col. 3, lines 7-14). Again, McMillan fails to disclose an active species. Rather, McMillan discloses argon carrier gas to flow the BST precursor mist over the substrate (see col. 17, lines 51-55). Further, McMillan specifically teaches away from using an active species with providing kinetic energy because McMillan discloses that the direction of mist flow is parallel to the substrate, which allows molecular collisions at ambient temperatures to affect the coating of a substrate, as opposed to the relative violent alternative of using the momentum of the particles or heating the liquid material to force or accelerate the deposition process (see col. 3, lines 33-39). Therefore, claim 1 is distinguishable from Satoh, McMillan, and their combination. Claims 2, 5, 15, 16 and 17 are likewise distinguishable over the applied references for at least the reasons discussed above

and for the additional features it recites. Withdrawal of the rejection of claims 1, 2, 5, 15, 16 and 17 is respectfully requested.

In item 6 of the Office Action, claim 3 is rejected under 35 U.S.C. §103(a) as unpatentable over Satoh in view of McMillan and in further view of U.S. Patent No. 6,146,905 to Chivukula et al. (hereinafter " Chivukula"). The rejection is respectfully traversed.

As discussed above, neither Satoh, McMillan, nor their combination discloses the features of claim 1. Chivukula fails to overcome the deficiencies of Chamberlain, Kuva or their combination. Thus, claim 3 is also distinguishable for at least the reason discussed above and for the additional features it recites. Withdrawal of the rejection of claim 3 is respectfully requested.

In item 7 of the Office Action, claim 12 is rejected under 35 U.S.C. §103(a) as unpatentable over Satoh in view of McMillan and in further view of U.S. Patent No. 5,563,762 to Leung et al. (hereinafter "Leung"). The rejection is respectfully traversed.

As discussed above, neither Satoh, McMillan nor their combination discloses the features of claim 1. Leung fails to overcome the deficiencies of Satoh, McMillan, or their combination. Thus, claim 12 is also distinguishable for at least the reason discussed above and for the additional feature it recites. Withdrawal of the rejection of claim 12 is respectfully requested.

In item 8 of the Office Action, claim 13 is rejected under 35 U.S.C. §103(a) over Satoh in view of McMillan, in view of Leung and in further view of U.S. Patent No. 5,932,904 to Hsu et al. (hereinafter "Hsu"), in further view of U.S. Patent No. 6,207,236 to Araki (hereinafter "Araki"). The rejection is respectfully traversed.

As discussed above, neither Satoh, McMillan, Leung, nor their combination discloses the features of claim 1. Hsu, Araki nor their combination overcomes the deficiencies of

Satoh, McMillan or Leung. Thus, claim 13 is distinguishable for at least the reasons discussed above and for the additional features it recites. Withdrawal of the rejection of claim 13 is respectfully requested.

II. CONCLUSION

In view of the foregoing amendments and remarks, Applicant submits that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-13 and 15-17 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicant's undersigned representative at the telephone number set forth below.

Respectfully submitted,

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JAO:EDM:SSK/lrd

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